



Peer-to-Peer

The Next Computing Frontier

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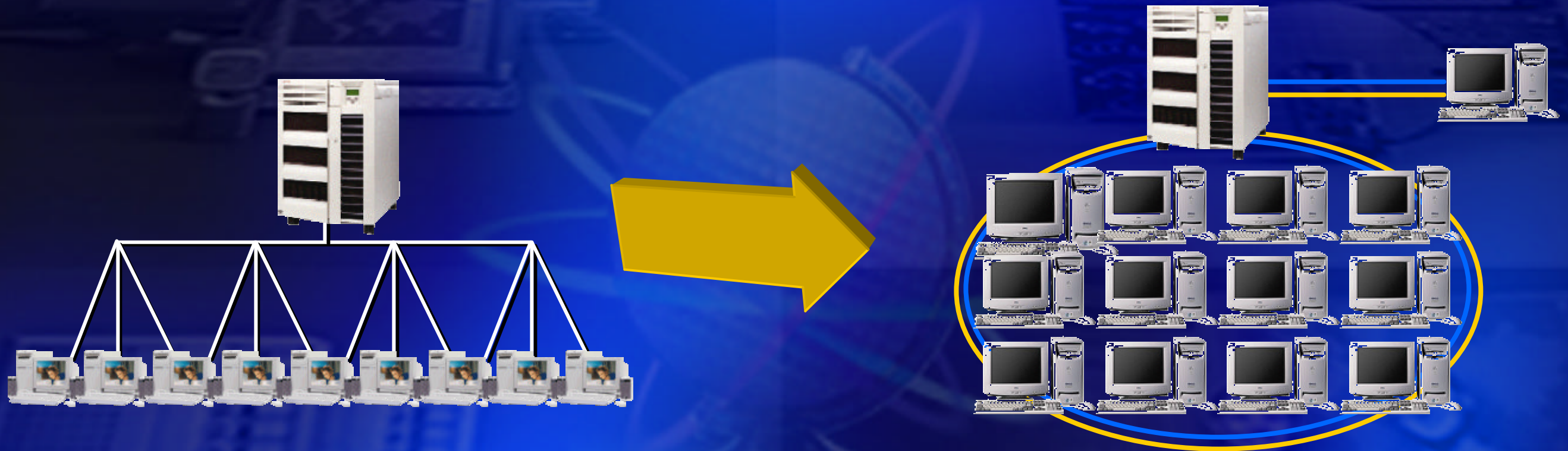
Vice President and CTO
Intel Architecture Group

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Agenda

- A revolution that could change computing as we know it
- Putting peer-to-peer into practice business
- Building the community in the next frontier

What is Peer-to-Peer?



Sharing of Computing Resources via
Direct Exchange Between Computers

What is Peer-to-Peer?

- Share information, cycles (MIPS), disk (storage)
- Ranges from totally direct to brokered exchanges
- Examples
 - Applied MetaComputing (Legion*)
 - United Devices
 - Hewlett-Packard (e-Speak*)
 - CenterSpan (Socket*)
 - Napster*

"The Internet as a Coordinator"

If a million people use a Web site simultaneously, doesn't that mean we must have a heavy-duty remote server to keep them all happy? No. We could move the site onto a million desktops and use the Internet for coordination.

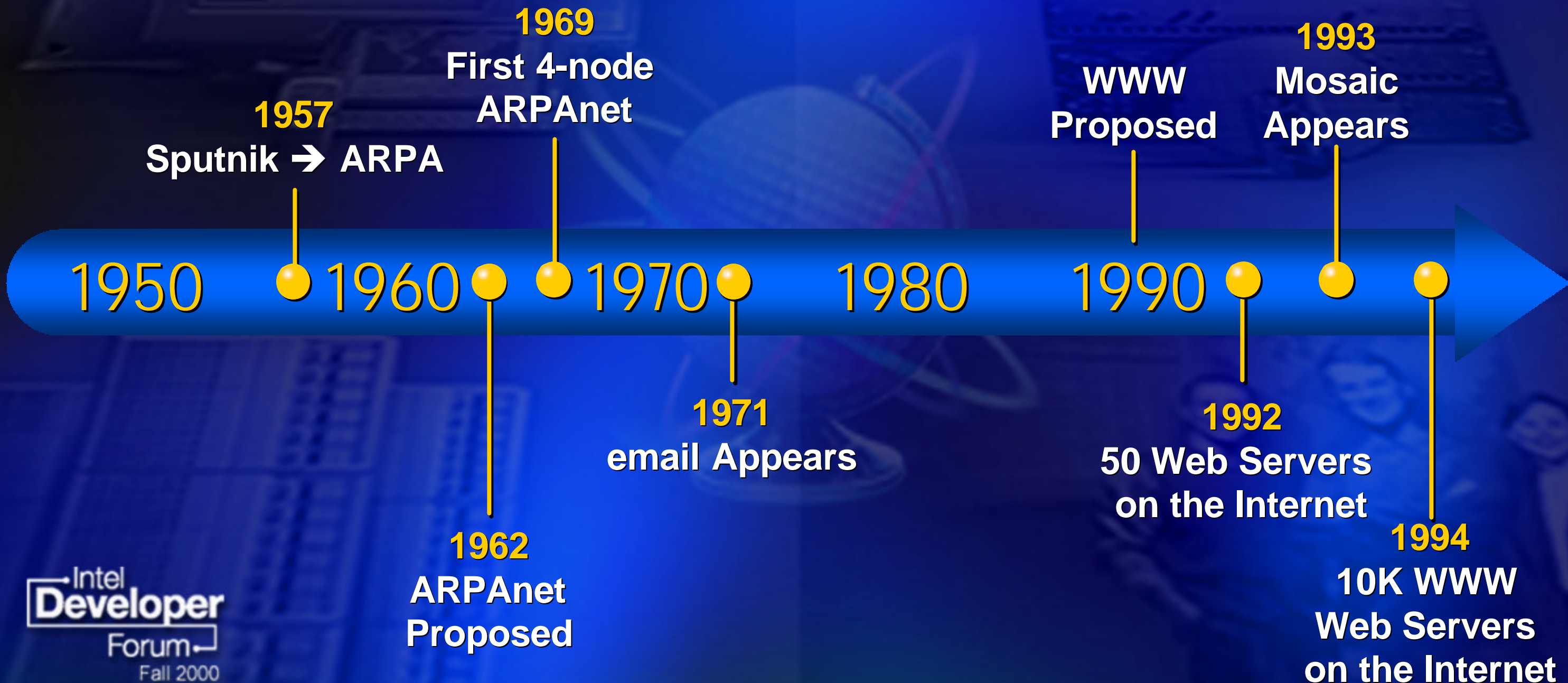
Could Amazon.com be an itinerant horde instead of a fixed Central Command Post? Yes.

David Gelernter
The Second Coming - A Manifesto

A Revolution in Progress

Peer-to-Peer Computing
could usher in the
Next Generation of the Internet
as Mosaic sparked the last

Evolution of the Internet



Compelling Value to Users: The Trigger Point for Revolutions

Pre-Mosaic Web

- NNTP
- WAIS
- Gopher
- WWW

Trigger

Mosaic

Key Components

Infrastructure

- Common Protocols
- Ease of Use
- Standards
- Scalability
- Security

Created the
“e” Revolution

Compelling Value to Users: The Trigger Point for Revolutions

Pre Peer-to-Peer Web

- Shared Drives
- FTP
- Windows*
for Workgroup

Trigger

Napster
Gnutella
FreeNet

Key Components

Infrastructure

- Common
Protocols
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- Security

**The Next
Computing
Revolution?**

**Our Job:
Build the Infrastructure**

The Real Opportunity: A Billion Connected Computers

Peer-to-peer is a natural,
self-organizing complement
to centralized client-server computing

The Self-Organizing Web: Emerging Usage Models

Applications are Almost Limitless

Collaboration

Universal File
Sharing

Distributed Computing

Edge Services

Intelligent Agents



Edge Services: An Example

Santa Clara

Ireland

Clients

Broker

Client

Edge Services Without Edge Servers

Peer-to-Peer Can Expand Enterprise Computing

- Ad-hoc formation and dissolution of "self-organized webs"
- Every computer – client and server – becomes a peer that contributes resources to the business
- New capabilities and computing resources from today's existing infrastructure

NetBatch in Intel's Design Environment

- Computing capacity demand growing 10-40X for each new microprocessor generation
 - But workstations sat idle 70% of the time, dedicated compute server utilization was 50%
- Developed NetBatch 10 years ago to enable peer-to-peer computing model

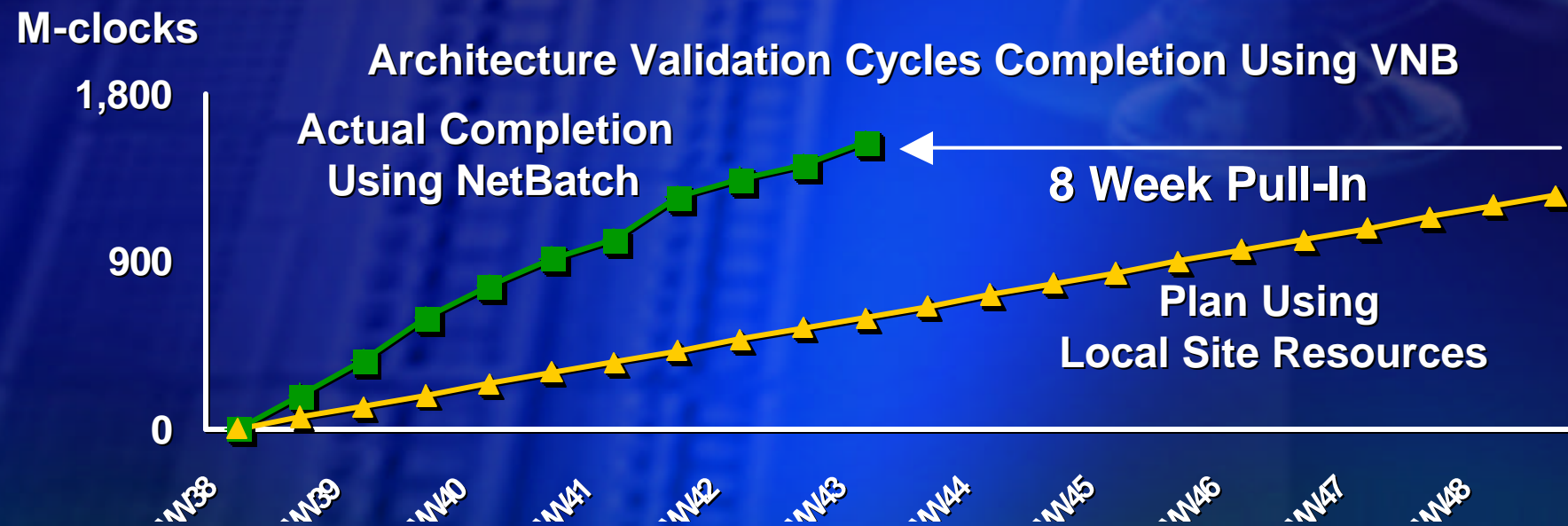
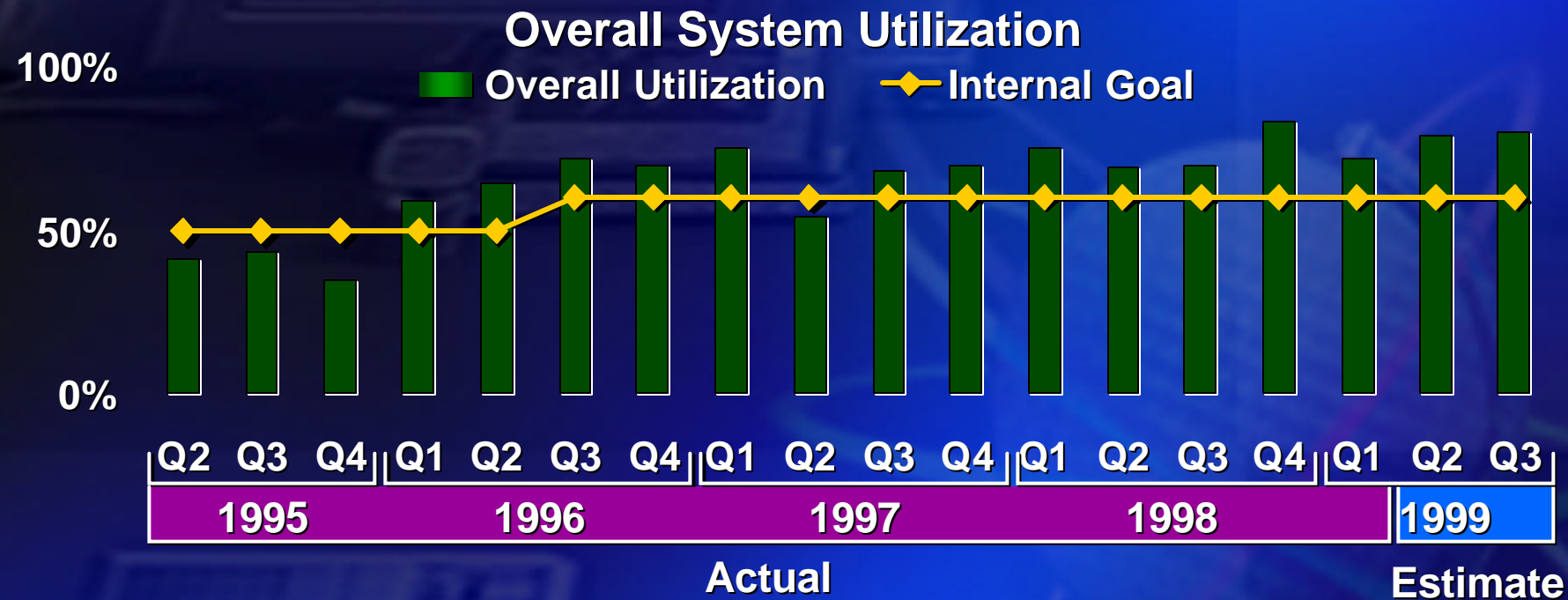
Goal: Utilize Idle CPU Cycles

Lab Time

6:33 PM



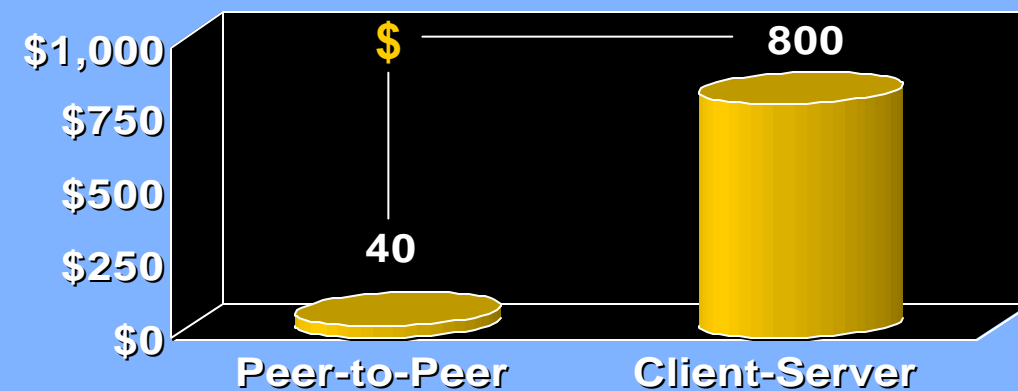
NetBatch: Use Computing Resources Efficiently



To Date, NetBatch
Has Saved Intel
Hundreds of
Millions
of Dollars in
Equipment and
Software

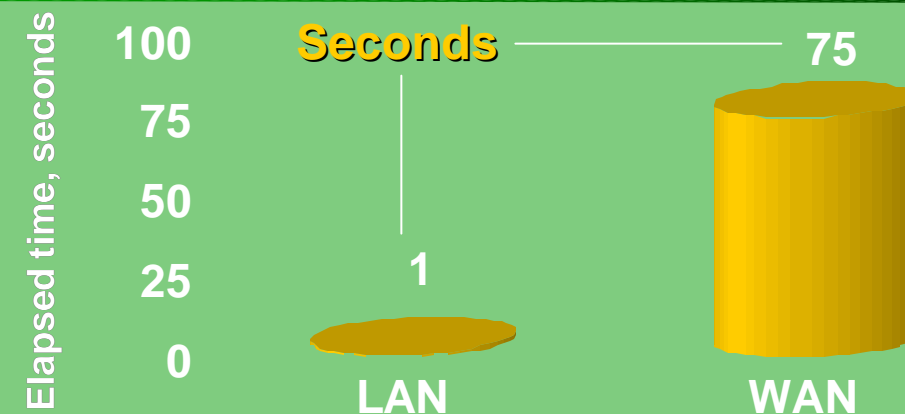
Peer-to-Peer Opportunities in the Enterprise

Storage Cost per Thousand Clients*



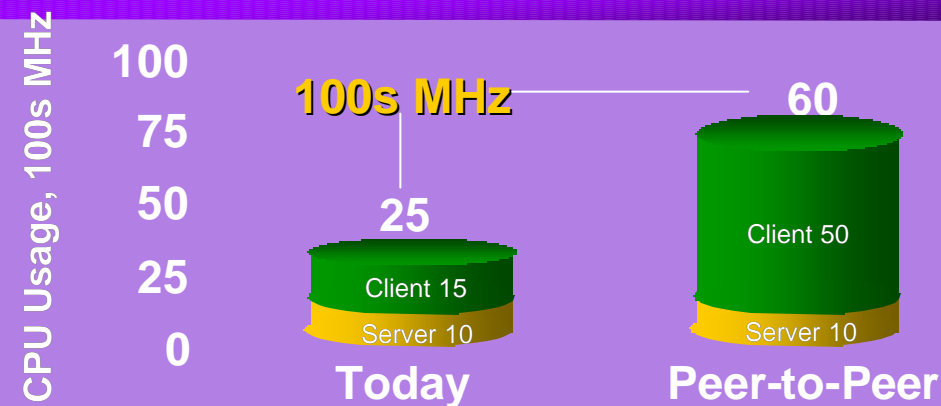
20X Storage Cost Opportunity

Network Performance**



75X Network Performance Opportunity

CPU Utilization



2.4X CPU Utilization Opportunity

Building the Peer-to-Peer Community

**What does it take to make it
viable in business?**

Requirements for Success

Pre Peer-to-peer Web

- Shared Drives
- FTP
- Windows* for Workgroup

Trigger

Napster
Gnutella
FreeNet

Key Components

Infrastructure

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- Ease of Use
- Standards
- Scalability
- Security

The Next
Computing
Revolution?

Peer-to-Peer Working Group



- First meeting scheduled for September 26, 2000 in Santa Clara
- Group and its output open to the industry
- More details at:

<http://www.Peer-to-PeerWG.org>

The Future of Peer-to-Peer

Cheryl Currid
President
Currid & Company

Peer-to-Peer Panel Discussion

Moderator:

Cheryl Currid, Currid & Company

Panelists:

David Anderson, United Devices & SETI@home

Dan Beldy, Hummer Winblad Venture Partners

Ian Clarke, Uprizer & FreeNet

Andrew Grimshaw, Applied MetaComputing

Ray Ozzie, Groove Networks

Summary

- The Revolution is Happening Now
- Peer-to-Peer Can Be Viable for Business
- Build the Community